EX PARTE OR LATE FILED

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February 12, 1999

Ms. Magalie R. Salas
Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
TW-A325
Washington, DC 20554

Ex Parte: Universal Service – CC Docket No. 96-45 and Forward-Looking Mechanism for Non-Rural LECs – CC Docket No. 97-160

Dear Ms. Salas,

Today, Jerry Harris, John Gahagan (GTE), Bob Cellupica (Network Engineering Consultants, Inc.), Barry Nigro, Tom Mitchell (Collier, Shannon, Rill, and Scott) and the undersigned met with Laurence Schecker of the Office of the General Counsel and Craig Brown, Chuck Keller, Katie King, Richard Smith, William Sharkey, Mark Kennet and Hung Le of the Accounting Policy Division of the Common Carrier Bureau. We discussed GTE's Application for Review of the Bureau's Order (DA 98-2567, released December 17, 1998) denying GTE's FOIA Request as well as various aspects of the Commission's HCPM cost model and GTE's suggestions as how the model can be improved. The enclosed material was used in the discussion.

Pursuant to Section 1.1206(a)(1) of the Commission's rules, and original and one copy of this letter are being submitted to the Office of the Secretary. Please associate this notification with the record in the proceeding indicated above.

If you have any questions regarding this matter, please call me at (202) 463-5293.

Sincerely,

W. Scott Randolph
Director - Regulatory Matters

Enclosures

cc: Laurence Schechter
Craig Brown
Chuck Keller
Katie King
Richard Smith
William Sharkey
Mark Kennett
Hung Le

GTE

FCC Universal Service Cost Model Issues

Issue Number	Issue	Comments
1	Model network only serves subscribed households (use of penetration rate), not all housing units, violating FCC Criterion 6 of sound economic engineering design and the regulatory requirements for service standards.	In the customer location database (non "BLOCK" types), use each record to indicate a housing unit/business location, and within each data record beginning at row 5, change the column "HH" (between third and fourth commas) to list all residential lines designed for that housing unit. Use 1 as a conservative surrogate if the housing unit is currently unoccupied. Reference Interfaced Cable Sizing Guideline (AT&T Handbook, 3-11) **See Attachment A.**
2	The HH in the customer location data is described as households (See Page 29-30 of HCPM documentation and the Maryland mock data), but its use in the code appears to indicate that it is actually number of residential lines instead (e.g. in the Rasterization Function (Lines 1389-1676)).	No fixes are needed if Issue #1 is fixed as indicated. **See Attachments B** for Pages 29-30 of HCPM Documentation and Rasterization Function (Lines 1389-1676 of C2).
3	FCC Model trues up business lines but does not true up single line business lines; this could cause USF to be under or overstated.	Add single lines business line counts in the Customer location data and then true-up for fund sizing. Code Reference = Clustinf.pas lines 379-486 **See Attachment C.**
4	FCC Model trues up on residence lines, however households are not trued up. This distorts the residence line to household ratio. For C&P wirecenters the ratio varies from 1 to 9.6.	No fixes are needed if Issue #1 is fixed as indicated. **See Attachment D.**
5	Model arbitrarily designates feeder placement investment as copper or fiber using fixed percentages that are hard coded in the Model. See HCPM Feedgrid.csv and HAI Feeder Outputs by Cluster Workfile. This also leads the Model to produces fiber placement costs in clusters and wire centers where no fibers are present.	Code Reference = Printout.pas lines 359-362. Replace factor with relative amount of copper and/or fiber cable investment. **See Attachment E.**
	Model is missing functional components, violating para. 11 of 5th Report & Order and FCC Criterion 2:	
	a). OSS	The model does not specify or calculate investment for OSS required in a competitive environment.
	b). Testing facilities	MLT, SARTS for loop testing in conjunction with operations factor **See Attachment F.**

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FCC Universal Service Cost Model Issues

Issue Number	Issue	Comments
	c). Capitalized Labor Costs for Trunk Installation. See Switching Investment Inputs for HCPM Platforms, prepared by BCPM Model Sponsors, Ex Parte dated 1/8/99.	Cost needs to be added-in even with BCPM sponsors proposed solution, with which GTE agrees. Code Reference "R50a_switching_host_remote xls. host remote P2, wire center investment T2, V2, BU2, BX2, Inputs C37"
6	d). Certain SS7 Signaling Links	IXC links absent from calculation, but MOU included. Code Reference = "R50a_switching_io_host_remote.xls, cells F55 & F56" **See Attachment G.**
7	Model uses extremely high line trunk ratio (compared to industry standard) and ignores modularity in its trunk capacity engineering. Trunk engineering also ignores the demand from IXCs. This further underestimates switching and interoffice investments.	Cost needs to be added-in even with BCPM sponsors proposed solution. Code Reference = "R50a_switching_host_remote.xls, host remote P2, R2; wire center investment BU2, BX2 IXC Links Absent From Calculation, but MOU (DEMS) Included.
8	Trunk port investment adjustment for end offices and tandem is not needed. The current setting leads to an illogical result: as trunk port costs increase, the total switch investment actually goes down. This is related to the adjustments of Analog Circuit Offset for DLC lines and Trunk Port Cost Reduction in the current Model. Those adjustments should not be needed given the fixed and per line switching investments would have taken them into account. See Switching Investment Inputs for HCPM Platforms, prepared by BCPM Model Sponsors, Ex Parte dated 1/8/99.	As stated in Issue 6 c.), some cost needs to be added-in even with BCPM sponsors proposed solution. Code Reference = "R50a_switching_host_remote.xls, host remote P2, R2; wire center investment BU2, BX2.
9	The use of DS1 instead of DS0 in the formula for additional OC3 caused the over estimate of OC3 investments in the versions prior to 2/2/99. This error still affects investments in the similar fashion for Digital Cross Connect System (DCS), Total OS Tandem ADM, and Total OS Tandem DCS.	Code Reference = "R50a_switching_host_remote.xls, tandem and STP investment, D10 & H9". Change to D8/trk_occ/28/24 and H8/trk_occ/28/24. **See Attachment H.**
10	FDI ACF is used against SAI investments in the loop module and then the resulted amount is subject to ACF another time, leading to underestimate of FDI costs.	Misuse of variable named tmp3 Code Reference = Tech.pas 124, 178, 188, 195. Replace with IntfcCost[n]^.cost in 178, 188, 195. **See Attachment I.**
11	Per-line expense capability will lead to double counting without manual changes to ARMIS database.	The new expense modules R50a_expense_wirecenter_fcc.xls and R50a_expense_density_fcc.xls provided on 02/02/99 contains the capability of using per line expenses. However without formula changes as explained in Attachment J, it would not work correctly and lead to double counting **See Attachment J.**

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FCC Universal Service Cost Model Issues

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12	Net salvage is taken into account incorrectly. Due to time values of money, the formula incorrectly estimates CCCfact, GrUpRORFactor,and DeprecFact (except under straight-line depreciation).	The error in the calculations of ACF are explained in **Attachment K**. The whole worksheet CCCFactor should be replaced to incorporate the correct method of calculating ACF.
13	No marketing expenses are allowed in the Model.	There is no place to enter this input in the model.
14	Operating taxes are calculated based on costs less overhead and customer costs, not all costs, contrary to current industry practice using the revenue or investment bases.	A corrected formula is given in **Attachment L.**
	Inconsistencies and errors within and between the expense modules for wire center and for density zone.	
	a). Inconsistent calculation for SAI expenses: in WC Module, it is based on underground fiber expense-to-investment factor while in DZ Module it is based on underground copper expense-to-investment factor. Not clear why would the "underground" factors be used for SAI expenses, especially in light of the fact the Model uses a composite of aerial, buried and underground cable lives for the SAI life.	A corrected formula using a expense factor based on a composite of all cable expenses is provided in **Attachment M1.**
	b). Inconsistency in the calculation of underground feeder placement expense and capital costs: expense based on Conduit expense-to-investment factor, and capital costs on Underground Metallic & Non Metallic Cable life.	A corrected formula for underground feeder placement expense based on underground metallic and non metallic expenses is in **Attachment M2.**
	c). MDF/protector expense is based on the life of Digital Circuit Equipment.	It would be more appropriate to use a composite of outside plant and switch lives for the MDF/Protector life. A corrected formula based on that is in **Attachment M3.**
	d). Drop and terminal lives used are some inexplicably weighted average of aerial buried and underground cables, but not specific to the type of placement	A corrected formula for weighted lives is in **Attachment N1.** The drop and terminal investments are not separated by the type of placement when they are pasted in the worksheet. Hence, use of a composite life seems the only way it can be done at present.

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FCC Universal Service Cost Model Issues

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	e). General support allocators are used to deduct a portion of expense, presumably to corporate and customer operations expenses. But, it appears these deducted expenses are not added back in the corporate and customer operations expense in the development of the Corporate Overhead Factor.	There is no rationale for using these allocators. To disable the use of these allocators, the formula for Total Operations General Support Allocator should be replaced by 0 and the formula for "Office Worker" General Support Alllocator should be replaced by 1. **See Attachment N2**.
	f). Inconsistency in the allocation of local signaling costs: in WC Module it is based on actual MOUs while DZ Module based on calculated MOUs.	The changes suggested are explained in **Attachment O.**
	g). In WC Module, feeder underground costs fail to take into account the structure sharing in expense calculations while it is accounted for in capital costs.	Since sharing of underground structure is accounted for in the loop module and the current version of the expense module has 100% of the structure allocated to ILEC to avoid double counting, it would not lead to any error at present. However a corrected formula is in **Attachment P1.**
	h). In WC Module, distribution underground costs fail to take into account the structure sharing in expense calculations while it is accounted for in capital costs.	Since sharing of underground structure is accounted for in the loop module and the current version of the expense module has 100% of the structure allocated to ILEC to avoid double counting, it would not lead to any error at present. However a corrected formula is in **See Attachment P2.**
	i). The average non-metallic cable life is calculated using aerial buried and underground non-metallic cable investment and lives. But in WC Module, only aerial investment for zone 850-2550 is used instead of investments for all density zones.	A corrected formula is in **Attachment Q.**
	j). EO Wire Center land capital costs are overstated due to use of incorrect equity fraction leading to overstating the taxable equity portion of return.	A corrected formula is in **Attachment R.**
15	**k).** In the Wire Center expense module theUSF costs do not include the local portion of tandem switch costs while they are correctly included in the Density Zone expense module.	A corrected formula is in **Attachment S.**

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FCC Universal Service Cost Model Issues

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16	The Wire Center Expense Module arbitrarily applies the sharing percentage of density zone 650-850 to the entire wire center, ignoring density zone specific sharing information.	From the history contained in the Wire Center expense module changes, it seems that the problem was fixed but subsequently taken out for some inexplicable reason. At present, to avoid structure sharing being applied twice, once in the loop module and then again in the expense module, the structure allocated to ILEC in the expense module has been made 100% in the input database file provided by FCC. If these inputs are retained, then the problem mentioned here would also be avoided at the same time. **See Attachment T.**
17	Clustering does not take into account the actual terrain conditions and as a result may not produce clusters that are actually feasible.	Discussion item.
18	No separate input for DLC fills.	Uses feeder fill factor. Code reference = Tech.pas, 105; Globals.pas, 150, 310; Terminal.pas, 46. Recommend separate DLC fill factor due to expandability of DLC. **See Attachment U.**
19	Model logic can lead to placement of coarser gauge cable to be used in Feeder and finer in distribution, violating the Resistance Design methodology, which specifies the finer gauge cable, is always placed closer to the central office in two-gauge designs.	This can be fixed easily by replacing Line 166 of tech.pas with " or (MaxDist^[i] > copper_gauge_xover)" so that the section between lines 163-167 looks like this: L163 technology := copper26; L164 (Blank) L165 if (c24 < c26) L166 or (MaxDist^[i] > copper_gauge_xover) L167 then technology = copper24;. This small change will force the Model to select the 24-gauge cables as feeder only if the distribution is using the 24-gauge cables, similar to the approach taken by the BCPM3.1 Model. **See Attachment V** for Tech.pas and for BCPM3.1 Doc, Page 56.
20	DLC sizes are hard-coded and do not include all sizes used by GTE in some areas.	GTE uses 224 and 448 line configurations to bridge the 96-672 line gap. Code Reference = terminal.pas, Tech.pas, Printout.pas, etc. Recommend option to include additional line configurations and costs.

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FCC Universal Service Cost Model Issues

Issue Number	Issue	Comments
21	Inconsistent inputs between modules. For example, (1) Pole material, labor and spacing inputs are not separate inputs in FCC Model's HCPM module but they are in its switching module; (2) the implied ACFs and Expenses in HAI modules are not linked to the ACFs used in HCPM module.	This can be fixed by structuring the Model differently so that there would be interactions among various modules The Model interfaces can be made such that before the HCPM module is executed, the relevant parts of HAI modules (that calculates the aerial structure costs and that calculate the ACFs and their expense factors) is executed first and the results are passed onto the HCPM module. The result of this change will allow a single source of inputs for the Model and when the Model runs, it executes the HAI modules, then the HCPM module, and then the HAI modules again to obtain the final results.
22	Model reports Low Density DLC RTs but no corresponding DLC lines.	Fix Could Cause Reduction In investment if DLC Offset Not Set to 0 Code Reference = workfile, distribution output by cluster, columns AE (number of low-density DLC RT's) and AL (number of DLC lines); printout.pas 273-287; R50a_switching_io-host_remote.xls, inputs C24. **See Attachments W & X.**
23	Small DLCs (96 and 24 line units) on fiber are counted as High Density DLCs. This is inconsistent with HCPM documentation paragraph 5.2.1 that states "low density DLC units with a line capacity of 96 or 24."	Code Reference = workfile, distribution output by cluster, columns AC (number of high-density DLC RT's); printout.pas, 270. **See Attachments W & X.**
24	The number of High Density DLCs appears to be incorrect because the number of 2016 line terminals is multiplied by three and the number of 1344 line terminals is multiplied by two for no apparent reason.	Code Reference = workfile, distribution output by cluster, columns AC (number of high-density DLC RT's); printout.pas, 270. **See Attachments W & X. If not changed, please explain rationale.**
25	Feeder material and placement costs for clusters are determined by multiplying the specific cost for the CBG times a FeedAllocation factor. This factor appears to be the lines in the cluster times the feeder distance divided by the sum of the lines in each cluster times the feeder distance for each cluster in the CBG. This distorts the actual costs in individual clusters and does not appear to be documented.	FCC is aware of this issue. May be Changed to Allocation Based on Lines. Check History.doc. Code Reference = printout.pas, 218-222. **See Attachment Y.**
26	The feeder distance in distribution output by cluster is, for no apparent reason, an allocated distance rather than the actual distance. The actual feeder distance is in feeder output by cluster	Inconsistent. Code Reference = workfile, distribution output by cluster, column F (main feeder distance; printout.pas, 247. **See Attachment Y.**

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FCC Universal Service Cost Model Issues

Issue Number	Issue	Comments
27	Cost minimization requires the minimization of both expenses and investments. The Model determines expenses after independent determination of investments. Model attempts to minimize investments only, not taking into account expenses or trade-offs between capital and expense.	Theoretical issue.
28	Costs are not correctly characterized in the optimization process, e.g. feeder cost optimization's use of life cycle costs will not capture the actual higher cost in the forward-looking environment: the Model does not include all households/housing units and any future growth. This violates FCC Criterion 1.	Theoretical issue.

ATTACHMENT A

Interfaced Cable Sizing Guidelines

Interfaced secondary cables are sized for the "ultimate" pair requirements. Accepted standards for pair allocations are as follows:

- **Residential** — two pairs per living unit.
  There are occasions when fewer than or more than two pairs per living unit are the optimum choice.
- **Small business** — five pairs per business.
  When determining ultimate business lines, it is usually best to be liberal.

Good engineering judgment should be used in determining requirements. The engineer should also have a knowledge of the land usage and the existing pair requirements in the area to be served by the interfaced secondary system cables. A study of the area should reveal:

- The number of existing living units
- The ultimate number of living units
- The ultimate business line requirements.

Using this information, the ultimate pair and binder group requirements can be developed for each lateral. These ultimate requirements for each lateral are then accumulated, working back toward the Serving Area Interface (SAI). To develop interfaced secondary cable sizes, the engineer should create a secondary system chart of the cables in the area being studied. An example is included on the next page.

ATTACHMENT B

block level input data is used. The algorithm specifies that Census blocks are to be subdivided into units with areas less than or equal to

$$\left(\frac{\text{Distance Limit}}{\text{Block divide factor}}\right)^2$$

Using the suggested inputs, Census blocks are therefore into squares no larger than 500 feet on a side, which is the default size of a raster cell.

Versions of Cluster with file creation dates after November 15, 1998 also can make use of a database file <TERRAIN.MDB>. This file must be placed in a sub-directory named "DB" in the working directory in which <CLUSTER.EXE> is located.[27] The file terrain.mdb, which currently contains the terrain data used in the BCPM model, version 1.1, consists of a list of all CBGs in the continental United States, and for each CBG, the terrain data inputs that will be used by FEEDDIST to determine the costs of structure placement. These data, which can also be read directly from input files, describe the depth of bedrock, rock hardness, soil type, water table depth, minimum slope and maximum slope.

Since the process of clustering can potentially take a long time when the number of customer locations is large, the cluster program attempts to keep the time devoted to clustering within manageable limits in various ways, which can be overridden by user input choices. The key user parameter which controls processing speed is the "Max pop cells" parameter, which is set by default equal to 1000. During the process of rasterization, the program assigns each of the individual customer locations specified in an input file to a raster cell. The target size for a raster cell is determined by the "Raster Size" variable. When the rasterization process is completed, a count of populated raster cells is done. If this number exceeds the specified maximum number of populated cells, the raster size is incremented by one unit.[28] This process continues until the number of populated cells is less than the user specified limit. When the divisive clustering algorithm is chosen, the maximum number of populated cells is set equal to "Max pop cells" multiplied by 3, since this results in roughly comparable time performance for the three alternative clustering algorithms.

6.2 Data Inputs for CLUSTER: <FILENAME>.IN

The currently recommended format for a cluster input file, <FILENAME>.IN, is a comma delimited ascii file. Each input file represents a single wirecenter with a single switch. Thus, the filename is typically the wirecenter code. The first line of the file should contain either the word "BLOCK" or the word "HOUSEHOLD" to identify the data aggregation level. (In both cases, however, the data points in <FILENAME>.IN represent individual customer locations. Input files with a "BLOCK" designation are automatically created by the Cluster program when actual Census block data is provided in a format described later in this section.) The second and fourth lines are header lines. The third line contains the wirecenter's CLLI code, the latitude and longitude of its switch, the latitude and longitude of its central point, and the name of the company that provides it service. Starting on the fifth line, there is a record for each block or household. That record contains the following data: the Census Block number for that location, the Longitude and Latitude of the record's central point (if a Census block) or geocode location (if a point location), eight fields which are ignored by current versions of the cluster program, and finally a number representing the area in thousands of square kilometers or 0 if the location represents a geocoded

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algorithms are used.

[27] Further information on the directory structure required in running the HCPM with its current interface to the HAI model can be found in the user guide "The HCPM/HAI Interface for a Cost Proxy Model Synthesis: A User Manual."

[28] If the number of populated cells exceeds "Max pop cells" when the raster size is equal to 500 feet, then a new rasterization is attempted with a raster size equal to 1000.

customer location. The CB number consists of a sequence of digits which identify the State FIPS, the County FIPS, the Tract No., and the Block No. The Longitude and Latitude report the angular distance in degrees from the Greenwich meridan and from the equater respectively. (The eight empty fields are used to maintain compatibility with previous input data sets used by HCPM. These fields previously contained terrain data that is now contained in a database described in the previous section.)

An example of the first few lines of a valid input file for a wire center in Maryland follows:

```
HOUSEHOLD
Wc_code, SwX, SwY, CenX, CenY, Company
BRWKMDBR,-77.632272,39.321787,-77.604468,39.338588,BELL ATLANTIC - MARYLAND INC - MD
CBNum,Lon,Lat,,,,,,,,Area
24021752400101,-77.646338186,39.390221784,,,,,,,,0
24021752400101,-77.638810428,39.401627187,,,,,,,,0
```

In previous versions of the HCPM Cluster module, the only available data consisted of Census block level data. When block level data is used, the model generates a set of surrogate customer locations by placing the households and businesses within the block randomly throughout a square whose center is located at the interior point of the Census block and whose area is equal to the area of the block. In order for this reformatting process to function properly when block level data is used, the input file, <FILENAME>.IN, must be prepared as a fixed format ascii file containing the following information:

Variable Name	Start Pos.	Length	Description
CBNUM	1	15	State FIPS + County FIPS + Tract No. + Block No.
LON	18	10	Longitude of block's central point
LAT	29	10	Latitude of block's central point
HH	40	7	Number of households in block
BUS	48	7	Number of business lines in block
AREALAND	56	7	Area of block in thousands of square kilometers
X	64	10	Longitude of switch
Y	75	10	Latitude of switch
WC_CODE	86	8	Wirecenter code
COMPANY	96	20	Company name
SIZE	117	1	Company size
PARENT	119	8	Parent company
TYPE	128	1	Type of switch
BEDROCK	130	8	Bedrock depth
HARDNESS	139	4	Rock type
SOIL	144	8	Soil texture
WATERTBL	153	7	Water table depth
MINSLOPE	161	7	Minimum slope
MAXSLOPE	169	7	Maximum slope

It is important to note that input files in this format do not have a header line.

In order to create these input files, one should collect the following data in the preliminary files (where *st* is a 2-letter State abbreviation and variables are enclosed in {}.):

(1) In *st*\c1.dbf there is block level data from the 1990 Census: {CBG, CBNUM, LAT, LON, BLCKHH, AREALAND}.

(2) In *st*\c2.dbf there is block group level data from the 1990 Census: {CBG, CBGHH}.

```
1369      j = InStr(Right$(inRec, Len(inRec) - i), ",")
1370      Lat = Val(Mid$(inRec, i + 1, j - 1))
1371
1372      curY = CLng(NSCirc * (Lat - CenY) / 360#)
1373      curX = CLng(EWCirc * (Lon - CenX) / 360#)
1374      If curX > maxX Then maxX = curX
1375      If curX < minX Then minX = curX
1376      If curY > maxY Then maxY = curY
1377      If curY < minY Then minY = curY
1378    Loop
1379    Close #infileNum
1380    XCen = CenX
1381    YCen = CenY
1382    Xmin = minX
1383    Ymin = minY
1384    Xmax = maxX
1385    Ymax = maxY
1386    numCustomers = k
1387    End Sub
1388
1389    Private Function Rasterization(sFilename As String, CenX As Double, CenY As
1390    Double, minX As Long, minY As Long, maxX As Long, maxY As Long, divisiveAlgo As
1391    Boolean, ByRef Raster() As RasterRec, RasterLength As Long, popCells As Long,
1392    numCells As Long, cols As Long) As Long
1393    Dim qrydef As QueryDef
1394    Dim rs As Recordset
1395    Dim strQry As String
1396    Dim myFile As String
1397    ' Dim strPath As String
1398    Dim EWCirc As Double
1399    Dim Lon As Double
1400    Dim Lat As Double
1401    Dim Geodata As Boolean
1402    Dim Area As Double
1403    Dim Res As Single
1404    Dim Bus As Single
1405    Dim ResTotal As Single
1406    Dim BusTotal As Single
1407    Dim dbResLines As Single
1408    Dim dbBusLines As Single
1409    Dim dbSpecial As Single
1410    Dim dbPublicLines As Single
1411    Dim SARatio As Single
1412    Dim PublicRatio As Single
1413    Dim L As Single
1414    Dim curX As Long
1415    Dim curY As Long
1416    Dim maxDist As Long
1417    Dim c As Long
1418    Dim r As Long
1419    Dim d As Long
1420    Dim i As Long, j As Long, k As Long
1421    Dim inRec As String
1422    Dim infileNum As Integer
1423    Dim maxpopRasterCells As Long
1424
1425    '- First do a database lookup to get line counts for this wirecenter
```

```
1426    ' strPath = App.Path & "\db\hcpm.mdb"
1427    If hcpmdbExist Then
1428      strQry = "select LineCount.BusLines, LineCount.ResLines, LineCount.Special, "
1429      strQry = strQry & "LineCount.Public"
1430      strQry = strQry & " from LineCount"
1431      strQry = strQry & " where LineCount.CLLI=[CLLICode]"
1432      Set qrydef = clusterdb.CreateQueryDef("", strQry)
1433      qrydef.Parameters![CLLICode] = Trim(wc_code)
1434      Set rs = qrydef.OpenRecordset(dbOpenDynaset)
1435      If rs.RecordCount > 0 Then
1436        rs.MoveFirst
1437        dbResLines = rs!ResLines
1438        dbBusLines = rs!BusLines
1439        dbSpecial = rs!Special
1440        dbPublicLines = rs!Public
1441      Else
1442        out1.Print "Invalid CLLI code " & wc_code
1443        dbResLines = -1
1444        dbBusLines = -1
1445      End If
1446      rs.Close
1447      Set rs = Nothing
1448      Set qrydef = Nothing
1449
1450    '- end db lookup
1451    End If
1452
1453    If dbBusLines > 0 Then
1454      SARatio = dbSpecial / dbBusLines
1455      PublicRatio = dbPublicLines / dbBusLines
1456    Else
1457    '-- using national default numbers here
1458      SARatio = 0.06
1459      PublicRatio = 0.05
1460    End If
1461
1462    EWCirc = NSCirc * Cos(2 * Pi * CenY / 360#)
1463    RasterLength = 0
1464    maxpopRasterCells = maxpopcells
1465    If divisiveAlgo = True Then
1466       maxpopRasterCells = maxpopcells * 3
1467    End If
1468    Do
1469      '-- Find the number of raster cells and dimension the raster array.
1470      RasterLength = RasterLength + rasterSize  '-- The dimension of a raster cell.
1471      cols = (maxX - minX) \ RasterLength + 1  '-- the number of columns
1472      r = (maxY - minY) \ RasterLength + 1  '-- the number of rows
1473      numCells = cols * r
1474      ReDim Raster(numCells)
1475
1476      '-- First compute total Res and Bus lines in wirecenter and compute true-up
1477    factors
1478      infileNum = FreeFile
1479      Open sFilename For Input As #infileNum
1480      Line Input #infileNum, inRec
1481      Line Input #infileNum, inRec
1482      Line Input #infileNum, inRec
```

```
1483      Line Input #infileNum, inRec
1484      ResTotal = 0
1485      BusTotal = 0
1486      Do While Not EOF(infileNum)
1487        Line Input #infileNum, inRec
1488        If inRec = "" Then Exit Do
1489        i = InStr(inRec, ",")
1490        j = InStr(Right$(inRec, Len(inRec) - i), ",")
1491
1492        i = i + j
1493        j = InStr(Right$(inRec, Len(inRec) - i), ",")
1494
1495        i = i + j
1496        j = InStr(Right$(inRec, Len(inRec) - i), ",")
1497        Res = Val(Mid$(inRec, i + 1, j - 1))
1498
1499        i = i + j
1500        j = InStr(Right$(inRec, Len(inRec) - i), ",")
1501        Bus = Val(Mid$(inRec, i + 1, j - 1))
1502
1503        ResTotal = ResTotal + Res
1504        BusTotal = BusTotal + Bus
1505      Loop
1506      Close #infileNum
1507
1508      '-- Compute the TrueUp Factors
1509      ResTrueUp = 1
1510      BusTrueUp = 1
1511      If True_Up.Value = 1 Then
1512        If dbResLines > -1 And ResTotal > 0 Then
1513          ResTrueUp = dbResLines / ResTotal
1514        End If
1515        If dbBusLines > -1 And BusTotal > 0 Then
1516          BusTrueUp = dbBusLines / BusTotal
1517        End If
1518      End If
1519
1520      '-- Compute the raster point for each cell.
1521      infileNum = FreeFile
1522      Open sFilename For Input As #infileNum
1523      Line Input #infileNum, inRec
1524      Line Input #infileNum, inRec
1525      Line Input #infileNum, inRec
1526      Line Input #infileNum, inRec
1527      Do While Not EOF(infileNum)
1528        Line Input #infileNum, inRec
1529        If inRec = "" Then Exit Do
1530        i = InStr(inRec, ",")
1531        j = InStr(Right$(inRec, Len(inRec) - i), ",")
1532        Lon = Val(Mid$(inRec, i + 1, j - 1))
1533
1534        i = i + j
1535        j = InStr(Right$(inRec, Len(inRec) - i), ",")
1536        Lat = Val(Mid$(inRec, i + 1, j - 1))
1537
1538        i = i + j
1539        j = InStr(Right$(inRec, Len(inRec) - i), ",")
```

```
1540        Res = ResTrueUp * Val(Mid$(inRec, i + 1, j - 1))
1541
1542        i = i + j
1543        j = InStr(Right$(inRec, Len(inRec) - i), ",")
1544        Bus = BusTrueUp * Val(Mid$(inRec, i + 1, j - 1))
1545
1546        curY = CLng(NSCirc * (Lat - CenY) / 360#)
1547        curX = CLng(EWCirc * (Lon - CenX) / 360#)
1548        '-- Now compute the number of DS0 equivalent lines for this location
1549        L = Res + Bus * (1 + SARatio + PublicRatio)
1550
1551        '-- k is an index over the raster cells, starting at the lower left.
1552        r = (curY - minY) \ RasterLength + 1  '-- the row
1553        c = (curX - minX) \ RasterLength + 1  '-- the column
1554        k = (r - 1) * cols + c                '-- the array index
1555
1556        '-- Add the location data to the raster cell's totals.
1557        Raster(k).Y = Raster(k).Y + curY * L
1558        Raster(k).X = Raster(k).X + curX * L
1559        Raster(k).L = Raster(k).L + L
1560      Loop
1561      Close #infileNum
1562
1563      '-- Finish the raster point calculation, add an index.
1564
1565      '-- Count the populated cells.
1566      j = 0
1567      For i = 1 To numCells
1568        If Raster(i).L > 0 Then
1569          j = j + 1
1570          Raster(i).Cell = i
1571          Raster(i).Y = CLng(Raster(i).Y / Raster(i).L)
1572          Raster(i).X = CLng(Raster(i).X / Raster(i).L)
1573        End If
1574      Next i
1575      popCells = j
1576
1577    Loop Until popCells <= maxpopRasterCells
1578
1579    '-- Find the slack in the raster process.
1580    '-- Slack represents the maximum distance of a customer from the raster point
1581    '-- Accounting for slack ensures that no customer location violates the
1582    distance limit
1583    maxDist = LBound_Lng
1584    infileNum = FreeFile
1585    Open sFilename For Input As #infileNum
1586    Line Input #infileNum, inRec
1587    If (UCase(Left$(inRec, 9)) = "HOUSEHOLD") Or (UCase(Left$(inRec, 5)) = "BLOCK")
1588    Or (UCase(Left$(inRec, 3)) = "GEO") Then
1589        Geodata = True
1590    End If
1591    Line Input #infileNum, inRec
1592    Line Input #infileNum, inRec
1593    Line Input #infileNum, inRec
1594    Do While Not EOF(infileNum)
1595      Line Input #infileNum, inRec
1596      If inRec = "" Then Exit Do
```

```
1597      i = InStr(inRec, ",")
1598      j = InStr(Right$(inRec, Len(inRec) - i), ",")
1599      Lon = Val(Mid$(inRec, i + 1, j - 1))
1600
1601      i = i + j
1602      j = InStr(Right$(inRec, Len(inRec) - i), ",")
1603      Lat = Val(Mid$(inRec, i + 1, j - 1))
1604
1605      If Geodata = True Then
1606        Area = 0
1607      Else
1608        i = i + j
1609        j = InStr(Right$(inRec, Len(inRec) - i), ",")
1610  '     Res = Val(Mid$(inRec, i + 1, j - 1))
1611        i = i + j
1612        j = InStr(Right$(inRec, Len(inRec) - i), ",")
1613  '     Bus = Val(Mid$(inRec, i + 1, j - 1))
1614        i = i + j
1615        j = InStr(Right$(inRec, Len(inRec) - i), ",")
1616  '     Bedrock = Val(Mid$(inRec, i + 1, j - 1))
1617        i = i + j
1618        j = InStr(Right$(inRec, Len(inRec) - i), ",")
1619  '     Hardness = Mid$(inRec, i + 1, j - 1)
1620        i = i + j
1621        j = InStr(Right$(inRec, Len(inRec) - i), ",")
1622  '     Soil = Mid$(inRec, i + 1, j - 1)
1623        i = i + j
1624        j = InStr(Right$(inRec, Len(inRec) - i), ",")
1625  '     WaterTbl = Val(Mid$(inRec, i + 1, j - 1))
1626        i = i + j
1627        j = InStr(Right$(inRec, Len(inRec) - i), ",")
1628  '     MinSlope = Val(Mid$(inRec, i + 1, j - 1))
1629        i = i + j
1630        j = InStr(Right$(inRec, Len(inRec) - i), ",")
1631  '     MaxSlope = Val(Mid$(inRec, i + 1, j - 1))
1632        i = i + j
1633        j = InStr(Right$(inRec, Len(inRec) - i), ",")
1634        If j <> 0 Then
1635          Area = Val(Mid$(inRec, i + 1, j - 1))
1636        Else
1637          Area = Val(Right$(inRec, Len(inRec) - i))
1638        End If
1639      End If  'Geodata = True
1640
1641      curY = CLng(NSCirc * (Lat - CenY) / 360#)
1642      curX = CLng(EWCirc * (Lon - CenX) / 360#)
1643      '-- k is an index over the raster cells, starting at the lower left.
1644      r = (curY - minY) \ RasterLength + 1  '-- the row
1645      c = (curX - minX) \ RasterLength + 1  '-- the column
1646      k = (r - 1) * cols + c                '-- the array index
1647
1648    If Raster(k).L > 0 Then
1649      '-- Find the slack distance in the raster cell.
1650      d = Abs(curX - Raster(k).X) + Abs(curY - Raster(k).Y)
1651
1652      '-- Add on the area for the diagonal of the block.
1653      If Area > 0 Then
```

```
1654        Area = (Area * 1000) * FeetPerMeter * FeetPerMeter '-- Area in square feet.
1655        d = d + CLng(Sqr(Area)) '-- Distance to cell centroid in LL.
1656      End If
1657
1658      '-- Keep only the biggest distance.
1659      If d > maxDist Then
1660        maxDist = d
1661      End If
1662    End If
1663    Loop
1664    Close #infileNum
1665
1666    '-- Compact the raster array.
1667    j = 0
1668    For i = 1 To numCells
1669      If Raster(i).L > 0 Then
1670        j = j + 1
1671        If j < i Then Raster(j) = Raster(i)
1672      End If
1673    Next i
1674    ReDim Preserve Raster(popCells)
1675    Rasterization = maxDist
1676    End Function
1677
1678    Private Sub Scale_PlottingRegion(minX As Long, minY As Long, maxX As Long, maxY
1679    As Long, popCells As Long, plot_x As Long, plot_y As Long, plot_scale As Long)
1680    Dim i As Long
1681    Dim j As Long
1682
1683    '-- Prepare the plotting region.
1684    i = maxY - minY
1685    j = maxX - minX
1686    If j = 0 Then j = 1
1687    If i < j Then i = j
1688    plot_scale = i
1689    maxY = minY + i
1690    plot_x = minX - (i * 0.1)
1691    plot_y = 0 - (i * 0.1)
1692    i = i * 1.2
1693    out3.Cls
1694    out3.FillStyle = 0
1695    out3.FillColor = RGB(0, 0, 0)
1696    out3.Scale (plot_x, plot_y)-(plot_x + i, plot_y + i)
1697    out3.AutoRedraw = True
1698
1699    End Sub
1700
1701    Private Sub Plot_popCells(ByRef Raster() As RasterRec, maxY As Long, plot_scale
1702    As Long, popCells As Long)
1703    Dim i As Long
1704    For i = 1 To popCells
1705      out3.Circle (Raster(i).X, maxY - Raster(i).Y), plot_scale / 1000
1706    Next i
1707    out3.AutoRedraw = False
1708    out3.Show 0
1709    End Sub
1710
```

ATTACHMENT C

	FCC Model Version			
	Single line business lines	Multline business lines	total business lines	Single line business lines as a percent of total business lines
11/4/98	115,404	1,036,785	1,152,189	10.02%
11/19/98	115,340	1,036,849	1,152,189	10.01%
12/7/98	17,032	1,135,157	1,152,189	1.48%
12/15/98	17,032	1,135,157	1,152,189	1.48%
1/5/99	17,032	1,135,157	1,152,189	1.48%
*1/19/99	17,939	1,000,739	1,018,678	1.76%
**2/2/99	17,939	1,000,739	1,018,678	1.76%

HAI 5.0a default			
Single line business lines	Multline business lines	total business lines	Single line business lines as a percent of total business lines
63,179	1,108,189	1,171,368	5.39%

* had to delete 3-offices to get model to run, BTHSMDRP from cluster.zip, FLNTMDFS and BLTMMDCH from clusinf.zip

** had to delete 2-offices to get model to run, BTHSMDRP from cluster.zip, and BLTMMDCH from clusinf.zip

```
358         c := Length(dataline);
359         vstr := copy(dataline,1,c);
360         vstr := trim(vstr);
361         GR^.CBG := vstr;
362         if ( Length(vstr)=0 ) then {ParseError('CBG Number',vstr,DataError);}
363         begin
364            TerrainError('CBG number',vstr,TerrainDataError);
365            Str(ran3(idum){system.random}:14:12,vstr);                { Put random number for CBG
366            GR^.CBG := copy(vstr,Pos('.',vstr)+1,12);
367         end;
368      end
369      else
370      begin
371         TerrainError('CBG number',vstr,TerrainDataError);
372         Str(ran3(idum){system.random}:14:12,vstr);                { Put random number for CBG
373         GR^.CBG := copy(vstr,Pos('.',vstr)+1,12);
374      end;
375  end;  { procedure }
376
377  (*=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=*)
378  (*=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=*)
379  procedure CalculateLineTrueUp;
380  (*
381     This procedure calculates the true-up factor needed to adjust line counts
382     at each location such that total residential lines for the wire center is
383     never less than total residential locations.  If total lines is greater
384     than locations, the true-up factor is 1.0.  The same operation is performed
385     for business lines.
386
387     Per conversation with Mike Lieberman, 14 December 1998.
388  *)
389  var
390     NumberOfPoints   : integer;
391     xtry             : double;
392     ytry             : double;
393     i                : integer;
394     c                : integer;
395     code             : integer;
396     data2            : string132;
397     vstr             : string14;
398     numtry           : integer;
399     dResLines        : double;
400     dBusLines        : double;
401     ResPoints        : double;
402     BusPoints        : double;
403
404  begin
405     reset(CLUfile2);
406     repeat
407        readln(CLUfile2,data2);
408     until copy(data2,1,2)='X,';
```

ATTACHMENT D

	A	B	C	D	E	F	G	BR
1	clli	Total Lines	business lines	residential lines	special access lines	single-line business lines	households	Lines per household (calculated)
2	CCHLMDCL	633	21	608	4	11	63	9.65
3	OCCYMDON	11,554	2,676	8,343	535	28	883	9.45
4	OCCYMDMB	6,128	407	5,639	82	-	865	6.52
5	NWMRMDNE	7,639	1,094	6,325	220	-	1,069	5.92
6	OCPNMDCR	4,823	431	4,305	87	2	903	4.77
7	MYVLMDMV	2,436	415	1,938	83	-	457	4.24
8	BTNRMDBR	741	-	741	-	-	178	4.16
9	BCTWMDBT	6,344	2,190	3,716	438	-	1,217	3.05
10	OCCYMDOC	5,720	1,671	3,714	335	47	1,221	3.04
11	PLVLMDPV	4,575	1,231	3,097	247	7	1,049	2.95
12	CCVLMDCH	5,323	1,397	3,647	279	-	1,495	2.44
13	CLVLMDCE	7,874	2,221	5,209	444	4	2,147	2.43
14	NWWNMDNW	1,250	159	1,059	32	31	467	2.27
15	CYVLMDDA	15,436	11,320	1,853	2,263	78	838	2.21
16	VINNMDVN	923	35	882	6	20	401	2.20
17	SMBGMDSM	4,215	471	3,649	95	34	1,875	1.95
18	BLTMMDMD	44,579	13,079	28,889	2,611	30	14,998	1.93
19	KTZMMDKM	950	24	921	5	-	479	1.92
20	HLBOMDTK	2,994	404	2,509	81	48	1,360	1.84
21	OXFRMDOX	710	-	710	-	-	387	1.83
22	NRBHMDNE	14,405	2,874	10,957	574	-	5,998	1.83
23	BRNDMDBE	3,530	789	2,582	159	17	1,442	1.79
24	HUVLMDHV	1,296	140	1,128	28	-	644	1.75
25	CTVLMDCT	38,030	10,899	24,951	2,180	104	14,462	1.73
26	PRHLMDPH	18,568	3,936	13,844	788	42	8,491	1.63
27	WHMRMDWM	3,159	352	2,736	71	38	1,679	1.63
28	WNRNMDWN	13,491	3,206	9,642	643	-	5,921	1.63
29	BLARMDBL	45,817	15,624	27,067	3,126	89	17,013	1.59
30	COTNMDCR	16,832	4,482	11,454	896	32	7,254	1.58
31	SHTWMDST	1,341	69	1,259	13	30	832	1.51
32	WDLWMDWL	33,097	9,696	21,463	1,938	81	14,388	1.49
33	GTVLMDGR	1,960	268	1,638	54	48	1,115	1.47
34	VYLEMDVL	2,315	102	2,193	20	38	1,506	1.46
35	HYVLMDRI	35,674	7,716	26,417	1,541	61	18,386	1.44
36	GMTWMDGN	40,411	8,813	29,838	1,760	123	20,830	1.43
37	UPMRMDCC	20,358	7,401	11,479	1,478	72	8,055	1.43
38	INHDMDIN	4,672	294	4,320	58	49	3,033	1.42
39	THRMMDTH	5,253	1,357	3,625	271	29	2,564	1.41
40	OWMLMDOM	31,622	14,517	14,204	2,901	33	10,064	1.41

	A	B	C	D	E	F	G	BR
1	clli	Total Lines	business lines	residential lines	special access lines	single-line business lines	households	Lines per household (calculated)
41	MLTWMDML	1,884	175	1,675	34	61	1,195	1.40
42	RIDGMDRI	1,605	112	1,470	23	47	1,053	1.40
43	RNTWMDRA	32,678	6,760	24,565	1,353	106	17,824	1.38
44	TNTWMDTN	4,834	1,123	3,486	225	35	2,536	1.37
45	BRWKMDBR	5,018	751	4,116	151	20	3,001	1.37
46	LNTWMDLT	4,567	739	3,680	148	12	2,685	1.37
47	RSTWMDRS	19,406	5,219	13,144	1,043	74	9,614	1.37
48	RKVLMDMR	49,093	26,450	17,355	5,288	125	12,701	1.37
49	OLNYMDOK	21,245	5,978	14,072	1,195	46	10,486	1.34
50	LARLMDLR	81,248	26,578	49,357	5,313	206	37,218	1.33
51	MARNMDMA	567	44	514	9	-	388	1.32
52	BOWIMDBO	26,259	6,166	18,860	1,233	215	14,244	1.32
53	DMSCMDDE	11,494	2,308	8,723	463	38	6,615	1.32
54	CPHGMDCA	39,400	13,119	23,662	2,619	259	17,975	1.32
55	GTBGMDGB	121,368	47,637	64,206	9,525	318	49,051	1.31
56	DNTNMDDT	4,882	1,155	3,496	231	54	2,673	1.31
57	FTWSMDCP	12,563	2,538	9,517	508	55	7,376	1.29
58	ARMGMDAR	32,138	6,415	24,443	1,280	197	19,046	1.28
59	ALTWMDAT	14,536	3,727	10,064	745	30	7,941	1.27
60	MANRMDMN	5,700	1,893	3,428	379	25	2,716	1.26
61	HGTWMDHG	55,800	18,247	33,904	3,649	298	26,875	1.26
62	RKVLMDRV	59,293	27,389	26,429	5,475	229	21,014	1.26
63	PARLMDPA	22,244	10,114	10,107	2,023	243	8,054	1.25
64	SLSPMDNB	29,834	5,247	23,535	1,052	70	18,776	1.25
65	HNCCMDHN	3,258	817	2,278	163	-	1,820	1.25
66	HLWDMDHW	4,173	313	3,798	62	-	3,046	1.25
67	FRDRMDFR	60,541	22,565	33,464	4,512	275	26,936	1.24
68	LDVRMDLO	38,090	13,878	21,437	2,775	117	17,263	1.24
69	BTVLMDBV	36,934	14,691	19,305	2,938	91	15,595	1.24
70	PIVLMDPK	47,073	14,993	29,084	2,996	153	23,533	1.24
71	ELCYMDEL	34,599	9,775	22,868	1,956	110	18,506	1.24
72	WLRDMDWR	2,247	123	2,100	24	55	1,700	1.24
73	WLVLMDWL	10,429	1,953	8,086	390	95	6,567	1.23
74	PKTNMDPK	6,508	1,517	4,686	305	37	3,808	1.23
75	SLSPMDNW	29,135	7,835	19,733	1,567	138	16,193	1.22
76	ARBTMDAR	48,445	18,249	26,548	3,648	210	21,892	1.21
77	BRLNMDBL	6,906	1,954	4,563	389	115	3,770	1.21
78	SYVLMDSK	20,073	5,465	13,516	1,092	61	11,181	1.21
79	PRANMDPA	4,352	703	3,510	139	96	2,915	1.20

	A	B	C	D	E	F	G	BR
1	clli	Total Lines	business lines	residential lines	special access lines	single-line business lines	households	Lines per household (calculated)
80	THVLMDTV	2,626	182	2,408	36	48	2,007	1.20
81	LNHMMDLN	42,231	17,375	21,382	3,474	126	17,883	1.20
82	OXHLMDOH	19,136	4,694	13,502	940	48	11,302	1.19
83	CHRTMDCH	9,575	3,190	5,747	638	75	4,815	1.19
84	HDGRMDHV	9,542	3,135	5,779	628	55	4,851	1.19
85	PCCYMDPK	6,214	1,367	4,572	275	106	3,853	1.19
86	QNTWMDQN	3,597	422	3,091	84	63	2,609	1.18
87	BTHSMDWA	16,320	4,457	10,971	892	19	9,280	1.18
88	TRPPMDTR	1,699	126	1,549	24	24	1,311	1.18
89	ODTNMDON	24,565	5,363	18,129	1,073	114	15,344	1.18
90	CMLDMDCM	28,024	9,948	16,088	1,988	142	13,666	1.18
91	EDWDMDEG	24,391	4,906	18,505	980	81	15,747	1.18
92	CLMAMDOB	25,470	13,288	9,527	2,655	20	8,129	1.17
93	DNDLMDDN	51,595	16,835	31,395	3,365	171	26,825	1.17
94	CCTNMDCL	2,084	286	1,742	56	59	1,490	1.17
95	BRHGMDBH	8,616	1,364	6,979	273	106	5,974	1.17
96	CLMAMDCB	53,056	18,895	30,385	3,776	121	26,072	1.17
97	CYVLMDCK	41,444	15,476	22,875	3,093	163	19,727	1.16
98	CNVLMDCT	4,231	1,184	2,809	238	12	2,438	1.15
99	NRTEMDNE	7,690	1,700	5,651	339	79	4,908	1.15
100	ABRDMDAB	17,140	4,689	11,513	938	90	10,015	1.15
101	BLTMMDYK	36,692	7,758	27,381	1,553	188	23,893	1.15
102	TWSNMDTW	73,636	37,793	28,291	7,552	224	24,693	1.15
103	BNBRMDBR	6,543	1,177	5,131	235	30	4,483	1.14
104	WOCYMDBA	2,844	1,118	1,501	225	-	1,312	1.14
105	SVPKMDSP	22,880	6,306	15,313	1,261	73	13,392	1.14
106	ESSXMDEX	52,707	14,561	35,234	2,912	260	30,825	1.14
107	SLRNMDSL	1,911	244	1,618	49	-	1,416	1.14
108	FPATMDFR	13,662	8,076	3,972	1,614	321	3,489	1.14
109	CHASMDCH	11,580	2,511	8,568	501	56	7,544	1.14
110	BLTMMDFR	35,840	6,867	27,598	1,375	149	24,380	1.13
111	GLBRMDGL	58,583	18,729	36,113	3,741	217	31,960	1.13
112	BLTMMDUV	53,771	17,919	32,268	3,584	195	28,588	1.13
113	BLTMMDHM	24,172	4,345	18,959	868	161	16,818	1.13
114	EKTNMDEK	21,122	6,994	12,731	1,397	143	11,320	1.12
115	SLSPMDSS	52,221	21,399	26,546	4,276	119	23,608	1.12
116	GALNMDGL	841	141	672	28	27	598	1.12
117	DRTNMDDR	2,787	598	2,069	120	9	1,846	1.12
118	PKVLMDPK	47,569	13,233	31,689	2,647	123	28,320	1.12

	A	B	C	D	E	F	G	BR
1	clli	Total Lines	business lines	residential lines	special access lines	single-line business lines	households	Lines per household (calculated)
119	HMPSMDHE	13,387	2,360	10,556	471	138	9,446	1.12
120	CHCYMDCH	2,091	365	1,654	72	36	1,484	1.11
121	WMNSMDWM	37,879	12,126	23,330	2,423	125	21,053	1.11
122	TLGHMDTL	427	24	398	5	11	360	1.11
123	BTHSMDBD	28,652	9,458	17,303	1,891	99	15,747	1.10
124	KDVLMDKV	6,052	898	4,972	182	84	4,540	1.10
125	WHTNMDWT	42,210	12,366	27,372	2,472	211	25,043	1.09
126	SLBRMDSB	45,295	15,139	27,131	3,025	484	24,823	1.09
127	HRLCMDHL	3,078	368	2,636	74	125	2,413	1.09
128	MGTNMDML	1,400	120	1,256	24	49	1,152	1.09
129	RKHLMDRH	1,626	291	1,277	58	14	1,172	1.09
130	CMBRMDCM	13,914	4,301	8,753	860	209	8,044	1.09
131	ESTNMDES	19,673	8,948	8,936	1,789	200	8,227	1.09
132	DRCRMDDC	15,553	5,271	9,229	1,053	63	8,498	1.09
133	DLMRMDDM	2,331	161	2,138	32	75	1,970	1.09
134	HYVLMDHY	47,990	18,498	25,795	3,697	78	23,809	1.08
135	BLTMMDED	35,437	7,264	26,719	1,454	244	24,838	1.08
136	MRBOMDMB	17,175	5,206	10,928	1,041	69	10,232	1.07
137	SMISMDSI	183	-	183	-	-	172	1.06
138	CSTWMDCR	7,578	1,997	5,183	398	67	4,879	1.06
139	MCHVMDMC	7,455	325	7,065	65	122	6,657	1.06
140	GNBOMDGR	3,114	186	2,892	36	61	2,732	1.06
141	SLSPMDCV	28,767	8,610	18,436	1,721	91	17,435	1.06
142	LXPKMDLX	14,610	2,359	11,779	472	174	11,305	1.04
143	BLTMMDLB	33,817	7,307	25,051	1,459	220	24,483	1.02
144	CHCHMDBE	59,901	32,601	20,782	6,518	303	20,454	1.02
145	MUTLMDMT	4,838	585	4,137	116	87	4,072	1.02
146	SNHLMDSH	4,018	893	2,945	180	15	2,901	1.02
147	BRRDMDBR	4,072	917	2,971	184	-	2,935	1.01
148	MAYOMDMY	12,976	3,082	9,279	615	183	9,170	1.01
149	EMBGMDEM	2,839	910	1,748	181	58	1,734	1.01
150	WLPTMDWP	10,623	2,820	7,240	563	114	7,194	1.01
151	HYVLMDCM	21,461	5,204	15,216	1,041	94	15,191	1.00
152	BADNMDBN	6,546	491	5,958	97	96	5,958	1.00
153	BRKLMDBK	35,686	12,603	20,565	2,518	208	20,565	1.00
154	BSHPMDBP	1,262	165	1,065	32	42	1,065	1.00
155	CLPKMDBW	38,485	12,260	23,777	2,448	307	23,777	1.00
156	CLSPMDCS	2,078	334	1,676	68	66	1,676	1.00
157	CRDFMDCD	4,709	1,011	3,495	203	59	3,495	1.00

	A	B	C	D	E	F	G	BR
1	clli	Total Lines	business lines	residential lines	special access lines	single-line business lines	households	Lines per household (calculated)
158	CRFDMDCR	3,580	785	2,638	157	38	2,638	1.00
159	DLISMDDL	777	83	677	17	-	677	1.00
160	EKRGMDPK	10,284	1,734	8,203	347	864	8,203	1.00
161	FDBGMDFE	3,567	597	2,852	118	45	2,852	1.00
162	FIVLMDFR	1,667	137	1,502	28	64	1,502	1.00
163	FLNTMDFS	1,247	-	1,247	-	-	1,247	1.00
164	FORKMDFK	8,253	1,877	6,000	376	59	6,000	1.00
165	FSBGMDFS	6,769	1,148	5,392	229	136	5,392	1.00
166	GLVLMDGL	10,076	1,378	8,422	276	300	8,422	1.00
167	GLWDMDGD	7,597	1,949	5,258	390	45	5,258	1.00
168	JRVLMDJE	11,431	2,224	8,763	444	72	8,763	1.00
169	LNCNMDLN	2,252	176	2,041	35	68	2,041	1.00
170	MTARMDMA	11,820	1,859	9,590	371	84	9,590	1.00
171	MTSVMDMS	817	30	781	6	16	781	1.00
172	NJMYMDNJ	1,123	42	1,074	7	18	1,074	1.00
173	NNTCMDNT	949	58	880	11	32	880	1.00
174	NRPNMDNP	12,294	3,802	7,732	760	56	7,732	1.00
175	OKLDMDOK	7,153	2,117	4,613	423	117	4,613	1.00
176	PSTNMDPS	2,052	223	1,785	44	46	1,785	1.00
177	SDVLMDSD	1,676	154	1,491	31	75	1,491	1.00
178	SLMNMDSL	8,516	594	7,803	119	216	7,803	1.00
179	STLDMDSL	40,985	10,223	28,717	2,045	148	28,717	1.00
180	STMCMDSM	3,533	494	2,939	100	88	2,939	1.00
181	STMRMDSM	25,256	2,737	21,973	546	329	21,973	1.00
182	STPNMDSP	1,306	139	1,139	28	33	1,139	1.00
183	STVLMDST	6,522	1,234	5,040	248	67	5,040	1.00
184	TMHLMDTH	46,179	10,495	33,586	2,098	322	33,586	1.00
185	TMVLMDTK	1,574	101	1,452	21	45	1,452	1.00
186	UNBRMDUB	2,765	473	2,198	94	61	2,198	1.00
187	WDRFMDWD	36,032	8,757	25,522	1,753	215	25,522	1.00
188	WNGTMDWG	809	87	704	18	40	704	1.00
189		3,313,753	1,018,678	2,091,428	203,647	17,939	1,731,257	1.21

ATTACHMENT E

	A	R	S	T	X	Y	Z
1	wire center	fiber fdr cbl inv, u/g	fiber fdr cbl inv, buried	fiber fdr cbl inv aerial	feeder u/g fiber plcmt inv	feeder buried copper plcmt inv	feeder buried fiber plcmt inv
2043	NWWNMDNW	480.78	5769.39	3365.48	626.24	6043.98	6043.98
2044	OCCYMDMB	0	0	0	11154.03	1336	1336
2045	OCCYMDMB	0	0	0	7817.66	936.38	936.38
2046	OCCYMDMB	0	0	0	16848.4	2018.05	2018.05
2047	OCCYMDMB	0	0	0	13514.19	1618.69	1618.69
2048	OCCYMDMB	0	0	0	6110.37	731.88	731.88
2049	OCCYMDMB	0	0	0	7364.12	882.05	882.05
2050	OCCYMDOC	19256.53	2567.54	3851.31	28214.5	3956.92	3956.92

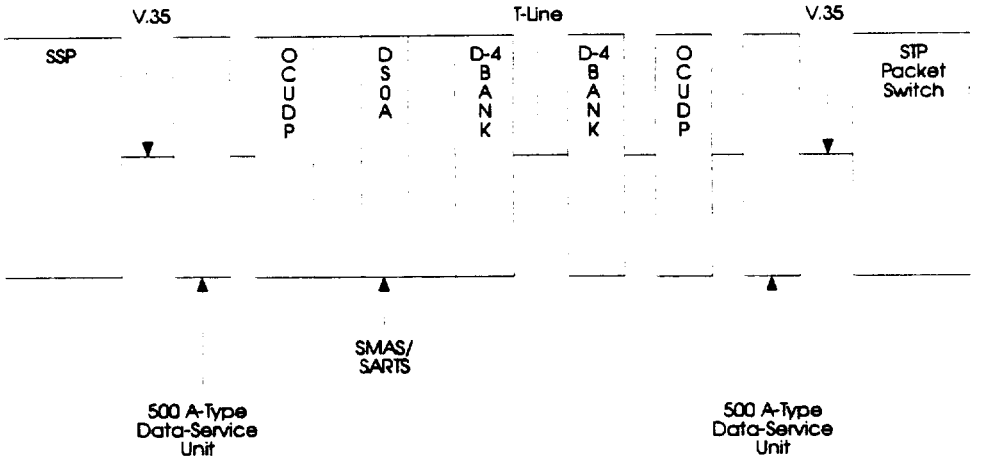
```
358                     FeedAllocation*FeedManholeCost:4:2,',',         { feeder manhole }
359                     FeedAllocation*0.45*(feed_ugd_structure):4:2,',', { copper feeder plcmt }
360                     FeedAllocation*0.45*(feed_ugd_structure):4:2,',', { fiber feeder plcmt }
361                     FeedAllocation*0.5*feed_bur_structure:4:2,',',  { copper buried plcmt }
362                     FeedAllocation*0.5*feed_bur_structure:4:2,',',  { fiber buried plcmt }
363                     FeedAllocation*feed_aer_structure:4:2,',',
364                     SA_array^[i]^.ugd_cable:4:2,',',
365                     SA_array^[i]^.bur_cable:4:2,',',
366                     SA_array^[i]^.aer_cable:4:2,',',
367                     SA_array^[i]^.ugd_structure*0.1:4:2,',', { conduit inv }
368                     SA_array^[i]^.ugd_structure*0.9:4:2,',', { conduit plcmt }
369                     SA_array^[i]^.bur_structure:1:0,',', { dist bur inv }
370                     SA_array^[i]^.aer_structure:1:0,',', { dist pole inv }
371                     CalcCuFeedFill:6:4,',',
372                     CalcCuDistFill:6:4,',',
373                     '0,',                   { calc mainframe fill }
374                     SA_array^[i]^.fiber_terminal_cost+SA_array^[i]^.t1_terminal_cost:4:2,',', { digital ter
375                     SA_array^[i]^.interface_cost:4:2,',',           { SAI invest }
376                     SA_array^[i]^.drop_terminal_cost:4:2,',',
377                     SA_array^[i]^.drop_cost:4:2,',',
378                     SA_array^[i]^.nid_cost:4:2,',',
379                     SA_array^[i]^.DistToSwitch*1000.0:6:4,',',
380                     SA_array^[i]^.grid_line_feet*1000.0:6:4,',');
381             if (SA_array^[i]^.n2016 +
382               SA_array^[i]^.n1344 +
383               SA_array^[i]^.n672 +
384               SA_array^[i]^.n96 +
385               SA_array^[i]^.n24) > 0 then write(outfile,SA_array^[i]^.lines:1:0,',')
386             else write(outfile,'0,');       { DLC lines }
387 { wtd cluster } writeln(outfile,(SA_array^[i]^.DistToSwitch+SA_array^[i]^.grid_line_feet/SA_array^[i]^.line
388 { avg loop length }
389
390             flush(outfile);
391
392         end;
393
394         close(outfile);
395
396
397         assign(outfile,'FEEDBYWC.CSV');
398         {$I-}
399         Append(outfile);
400         {$I+}
401         if (IOResult<>0) then
402         begin
403             new(title_vec);
404             assign(title_file,'title3.txt'); reset(title_file);
405             rewrite(outfile);
406             for i := 1 to 16 do
407             begin
408                 readln(title_file,title_vec^[i]);
```

ATTACHMENT F

8.3.5 Present Link Testing Strategy

There are various strategies for link testing.

- Figure 8-16 shows CCS test access via Switched Maintenance Access System/ Switched Access Remote Test Systems (SMAS/SARTS) (a typical A-Link 56-kbps circuit). This is the present link-testing strategy. The figure shows the SMAS/SARTS with wired-in-access for loopback testing.
- Figure 8-17 shows digital test access via the Digital Cross-Connect System (DCS). This is also a present strategy.
- Figure 8-18 shows the DS0A link testing arrangement which provides an opportunity for in-depth maintenance testing of the links used in the CCS network. A series of data port-type channel units (DS0-DP) connects the CCS network elements. At the SSP, the V.35 interface is used.



Legend:

DS0A = Digital Signal Zero
OCUDP = Office Channel Unit Data Port
SARTS* = Switched Access Remote Test Systems
SMAS* = Switched Maintenance Access System
SSP = Service Switching Point
STP = Signaling Transfer Point

* AT&T-manufactured systems used to access and test special service circuits from a remote location

Figure 8-16. CCS Test Access via SMAS/SARTS

8.9.1 Automatic Repair Service Bureau

The ARSB provides mechanized repair service administration, recordkeeping, trouble analysis, and testing. It is composed of the Loop Maintenance Operations System (LMOS), Mechanized Loop Testing (MLT) System, and Loop Cable Maintenance Operations System (LCAMOS). The major objectives of the ARSB are to

- Improve maintenance center efficiency and reduce the cost of repair operations
- Improve customer service by more rapid detection, location, and repair of troubles
- Improve customer contact handling by providing the RSA with timely customer-oriented information.

8.9.2 Loop Maintenance Operations System

LMOS mechanizes customer line records and produces basic management and trouble history reports. Specific primary functions include trouble report processing, online management reports, control of automated testing, and analysis of past trouble reports via the Trouble Report Evaluation and Analysis Tool (TREAT) or a similar measurement and analysis system. The system acts on data derived from trouble report status entries (customer calls or employee originated) relative to open troubles and trouble history. A secondary function of LMOS is to feed inventory systems that provide management reports (for example, equipment use reports).

8.9.3 Mechanized Loop Testing System

The MLT system is an automated testing system that works with LMOS. The MLT system accesses a customer's loop using either no-test trunks to the switch serving the loop or trunks to test shoes at the distribution frame on which the loop is terminated. The MLT system then performs a series of adaptive tests under computer control. LMOS line record information is fed into the test algorithms so that each test series is custom-tailored to the expected electrical characteristics of the line. MLT outputs include pass/fail indications, analog-measurement results, and recommended actions, depending upon the transaction selected and the user. MLT and LMOS are designed to work with pair-gain configurations as well as standard cable pair arrangements. Other test sets may be utilized by central office and cable technicians to enhance MLT test results when necessary.

8.9.4 Loop Cable Maintenance Operations System

LCAMOS, which is integrated with LMOS/MLT, provides for the prediction, tracking, and analysis of cable troubles. The Cable Repair Administrative System (CRAS) is one module

ATTACHMENT G

Switch Cost Understatement due to:

Trunk Port Algorithmic Error –
R50a_switching_io_host_remote.xls

1 - In Columns BU2 & BX2 "Autonomous Switch Investment Per Line" & "Aggregate Switch Investment" of the Wire Center Investment Worksheet (R50a_switching_io.xls), $16.67 ($100/6) is removed based on a 6:1 line:trunk ratio

3 - Columns BU2 & BX2 "Autonomous Switch Investment Per Line" & "Aggregate Switch Investment" of the Wire Center Investment Worksheet (R50a_switching_io.xls), $X ($100*calculated #of local trunks/calculated # lines) is added back in based on a calculated line:trunk ratio (Typically between 13 to 15:1, ≈ $7)

Typically understates per line investment associated with trunk ports by ≈ $9.67 ($16.67 - $7)

R50a_switching_io_host_remote.xls, Cell BU2

=IF(C2=0,0,IF(sw_type="A",1/C2*VLOOKUP(F2/B2/line_fill,sw_inv_tbl,IF(OR(BY2=8,BY2=1),2,8))+VLOOKUP(F2/B2/line_fill,sw_inv_tbl,IF(OR(BY2=8,BY2=1),5,11))-inputs!$C$37/6-inputs!$C$24*(BE2)/'loop db inputs'!D2+(Z2*inputs!$C$97/2+C2/F2*inputs!$C$37*(L2*2+O2+R2+AC2+AF2+AI2*2+AL2)),IF(AND(sw_type="H",B2>1),1/C2*VLOOKUP(F2*(1-1/B2)/B2/line_fill,sw_inv_tbl,IF(OR(BY2=8,BY2=1),2,8))+VLOOKUP(F2*(1-1/B2)/B2/line_fill,sw_inv_tbl,IF(OR(BY2=8,BY2=1),5,11))-inputs!$C$37/6-inputs!$C$24*(BE2)/'loop db inputs'!D2+(Z2*inputs!$C$97/2+C2/F2*inputs!$C$37*(L2*2+O2+R2+AC2+AF2+AI2*2+AL2)),0)))*sw_install_mult

R50a_switching_io_host_remote.xls, Cell BX2

=IF(sw_type="",IF(OR(BY2=8,BY2=1),inputs!$C$3,inputs!$C$2)+inputs!$C$4*LN(F2/B2/inputs!$C$18)-inputs!$C$37/6-inputs!$C$24*(BE2)/'loop db inputs'!D2+(Z2*inputs!$C$97/2+C2/F2*inputs!$C$37*(L2*2+O2+R2+AC2+AF2+AI2*2+AL2)),0)/line_fill*sw_install_mult

ATTACHMENT H

Tandem investment calculations						
total tandems in service area	#N/A					
total business lines in service area	0					
total residential lines in service area	0					
total public access lines in service area	0		number of operator tandems	#N/A		
total tandem-routed interoffice CCS	#DIV/0!		total operator traffic, CCS	#DIV/0!		
total special access lines in service area	-		total operator DS-3s	H8/trk_occ/28		
total tandem DS-3s	D8/trk_occ/28					
			total operator positions	#DIV/0!		
total common equipment investment	#N/A					
per-line switch common equipment investment	#N/A		total OS tdm common equipment	#N/A		
total wire center investment	#N/A					
per-line wire center investment	#N/A		total OS tdm, per line	#N/A		
STP investment calculations			total operator position investment	#DIV/0!		
total STP pairs in service area	#N/A					
			total operator pos. investment/line	#DIV/0!		
total STP investment	#N/A					
total STP wire center investment	#N/A					
STP wire center investment per line	#N/A		total OS tdm wire center	#N/A		
total investment per line	#N/A					
excess STP capacity, links	#N/A		total OS tdm wire center, per line	#N/A		
excess STP capacity required	#N/A					
Total tandem-routed BHCA						
business	#DIV/0!					
residential	#DIV/0!		total additional bridge ADMs required		-	
			total added ADM and DCS investment per line	$	-	
Excess tandem real time capacity, BHCA	#N/A		total tandem ADM inv per tdm loc	#N/A		
Excess tandem trunk capacity, trunks	#N/A		total tandem DCS inv per tdm loc	#N/A		
			average interoffice distance, mi	#DIV/0!		
Excess tandem switches, real-time basis	#N/A		total OS tdm ADM inv per loc	#N/A		
Excess tandem switches, trunk basis	#N/A		total OS tdm DCS inv per loc	#N/A		
			entrance facility calculations			
Signaling link calculations						
			terminal multiplexer, per line	#N/A		
			cable investment, per line	#DIV/0!		
			u/g placement, per line	#N/A		
			buried placement, per line	#N/A		
			pole inv, per line	#N/A		
NECA company code	0		pullbox inv, per line	#N/A		
			conduit inv, per line	#N/A		
total tandems	#N/A		total per line e.f. investment	#N/A		
total tdm/STP distance	#N/A		total SA lines		-	
avg tdm/STP distance	#N/A		total switched access trunks		-	
avg D link investment, per link	#DIV/0!		total OC-48s, w/fill		-	
			no. of entrance facilities	#N/A		

tandem and STP investment

CORRECTED

	Tandem investment calculations						
	total tandems in service area	#N/A					
	total business lines in service area	0					
	total residential lines in service area	0					
	total public access lines in service area	0			number of operator tandems		#N/A
	total tandem-routed interoffice CCS	#DIV/0!			total operator traffic, CCS		#DIV/0!
	total special access lines in service area	-			total operator DS-3s		H8/trk_occ/28/24
	total tandem DS-3s	D8/trk_occ/28/24					
					total operator positions		#DIV/0!
	total common equipment investment	#N/A					
	per-line switch common equipment investment	#N/A			total OS tdm common equipment		#N/A
	total wire center investment	#N/A					
	per-line wire center investment	#N/A			total OS tdm, per line		#N/A
	STP investment calculations				total operator position investment		#DIV/0!
	total STP pairs in service area	#N/A					
					total operator pos. investment/line		#DIV/0!
	total STP investment	#N/A					
	total STP wire center investment	#N/A					
	STP wire center investment per line	#N/A			total OS tdm wire center		#N/A
	total investment per line	#N/A					
	excess STP capacity, links	#N/A			total OS tdm wire center, per line		#N/A
	excess STP capacity required	#N/A					
	Total tandem-routed BHCA						
	business	#DIV/0!					
	residential	#DIV/0!			total additional bridge ADMs required		-
					total added ADM and DCS investment per line	$	-
	Excess tandem real time capacity, BHCA	#N/A			total tandem ADM inv per tdm loc		#N/A
	Excess tandem trunk capacity, trunks	#N/A			total tandem DCS inv per tdm loc		#N/A
					average interoffice distance, mi		#DIV/0!
	Excess tandem switches, real-time basis	#N/A			total OS tdm ADM inv per loc		#N/A
	Excess tandem switches, trunk basis	#N/A			total OS tdm DCS inv per loc		#N/A
					entrance facility calculations		
	Signaling link calculations						
					terminal multiplexer, per line		#N/A
					cable investment, per line		#DIV/0!
					u/g placement, per line		#N/A
					buried placement, per line		#N/A
					pole inv, per line		#N/A
	NECA company code	0			pullbox inv, per line		#N/A
					conduit inv, per line		#N/A
	total tandems	#N/A			total per line e.f. investment		#N/A
	total tdm/STP distance	#N/A			total SA lines		-
	avg tdm/STP distance	#N/A			total switched access trunks		-
	avg D link investment, per link	#DIV/0!			total OC-48s, w/fill		-
					no. of entrance facilities		#N/A

ATTACHMENT I

	A	AM	AN
1	wire center	SAI inv	SAI inv / annual charge factor(calculated)
2	ABRDMDAB	231.38	1000.0
3	ABRDMDAB	809.81	3500.0
4	ABRDMDAB	462.75	2000.0
5	ABRDMDAB	231.38	1000.0
6	ABRDMDAB	925.5	4000.0
7	ABRDMDAB	925.5	4000.0
8	ABRDMDAB	925.5	4000.0
9	ABRDMDAB	809.81	3500.0
10	ABRDMDAB	925.5	4000.0
11	ABRDMDAB	925.5	4000.0
12	ABRDMDAB	1156.88	5000.0
13	ABRDMDAB	925.5	4000.0
14	ABRDMDAB	925.5	4000.0
15	ALTWMDAT	925.5	4000.0
16	ALTWMDAT	809.81	3500.0
17	ALTWMDAT	925.5	4000.0
18	ALTWMDAT	925.5	4000.0
19	ALTWMDAT	925.5	4000.0
20	ALTWMDAT	925.5	4000.0
21	ALTWMDAT	462.75	2000.0
22	ALTWMDAT	925.5	4000.0
23	ALTWMDAT	809.81	3500.0
24	ALTWMDAT	925.5	4000.0
25	ALTWMDAT	809.81	3500.0
26	ARBTMDAR	231.38	1000.0
27	ARBTMDAR	809.81	3500.0
28	ARBTMDAR	925.5	4000.0
29	ARBTMDAR	925.5	4000.0
30	ARBTMDAR	809.81	3500.0
31	ARBTMDAR	925.5	4000.0
32	ARBTMDAR	809.81	3500.0
33	ARBTMDAR	809.81	3500.0
34	ARBTMDAR	809.81	3500.0
35	ARBTMDAR	809.81	3500.0
36	ARBTMDAR	462.75	2000.0
37	ARBTMDAR	1156.88	5000.0
38	ARBTMDAR	925.5	4000.0
39	ARBTMDAR	809.81	3500.0
40	ARBTMDAR	925.5	4000.0
41	ARBTMDAR	925.5	4000.0
42	ARBTMDAR	925.5	4000.0
43	ARBTMDAR	925.5	4000.0
44	ARBTMDAR	925.5	4000.0
45	ARBTMDAR	925.5	4000.0
46	ARBTMDAR	925.5	4000.0
47	ARBTMDAR	1156.88	5000.0
48	ARBTMDAR	925.5	4000.0

```
103
104         tmp1 :=
105           fiber_terminal_cost_fn(SA_array^[i]^.lines/FillFactor,feeder_distance,SA_array^[i]^.density,
106               n2016,n1344,n672,n96,n24,
107               pct_ugd,pct_bur,pct_aer);
108         tmp1 := tmp1*ac_fib_term;
109
110         lf := (n2016+n1344+n672+n96+n24)*4.0/FiberFillFactor;
111
112         { Calculate provisional terminal costs.  Note that the terminal cost fns use DS0 equivalent lines, s
113         { need the fill factor, but not DS1 calculations.                                                  }
114
115
116         tmp2 :=
117           t1_terminal_cost_fn(SA_array^[i]^.lines/FillFactor,n96,n24);
118         tmp2 := tmp2*ac_t1_term;
119
120         tmp3 := zero;
121         for n := 1 to NumXCBoxSizes do
122         if l26 >= IntfcCost[n]^.NumLines
123         then tmp3 := IntfcCost[n]^.cost;
124         tmp3 := tmp3*ac_fdi;
125
126
127
128         { We will choose feeder technology by least-cost under the assumption that each SA sends feed
129         { to the switch without sharing cable.  For digital terminals, the cost of an FDI is added.    }
130
131
132         cost[copper26] := feed_cable_cost(l26,density,copper26,uc,bc,ac,uf,bf,af,pct_ugd,pct_bur,pct_a
133         cost[copper26] := (uc*ac_ugd_cop + bc*ac_bur_cop + ac*ac_aer_cop + uf*ac_ugd_fib + bf*ac_b
134                     feeder_distance + tmp3;
135
136         cost[copper24] := feed_cable_cost(l24,density,copper24,uc,bc,ac,uf,bf,af,pct_ugd,pct_bur,pct_a
137         cost[copper24] := (uc*ac_ugd_cop + bc*ac_bur_cop + ac*ac_aer_cop + uf*ac_ugd_fib + bf*ac_b
138                     feeder_distance + tmp3;
139
140         cost[t_1] := feed_cable_cost(lt1,density,t_1,uc,bc,ac,uf,bf,af,pct_ugd,pct_bur,pct_aer);
141         cost[t_1] := (uc*ac_ugd_cop + bc*ac_bur_cop + ac*ac_aer_cop + uf*ac_ugd_fib + bf*ac_bur_fib
142                   feeder_distance + tmp2 + tmp3;
143
144         cost[fiber]  := feed_cable_cost( lf,density,fiber,uc,bc,ac,uf,bf,af,pct_ugd,pct_bur,pct_aer);
145         cost[fiber]  := (uc*ac_ugd_cop + bc*ac_bur_cop + ac*ac_aer_cop + uf*ac_ugd_fib + bf*ac_bur_f
146                     feeder_distance + tmp1 + tmp3;
147
148
149         if (feeder_distance + SA_array^[i]^.MaxDistance > copper_gauge_xover)
150         or (feeder_distance + SA_array^[i]^.MaxDistance > max_copper_distance)
151         or (feeder_distance > copper_t1_xover)
152         then cost[copper26] := big;
153
```

```
154        if (feeder_distance + SA_array^[i]^.MaxDistance > max_copper_distance)
155        or (feeder_distance > copper_t1_xover)
156        then cost[copper24] := big;
157
158        if (feeder_distance > t1_fiber_xover)
159        then cost[t_1] := big;
160
161        cmin := cost[copper26]; techmin := copper26;
162        for t := copper26 to fiber do
163           if cost[t] < cmin then
164           begin
165              techmin := t;
166              cmin    := cost[t];
167           end;
168
169
170        technology := techmin;
171        SA_array^[i]^.feeder_technology := techmin;
172
173        if technology = fiber then
174        begin
175           SA_array^[i]^.fiber_terminal_cost :=
176           fiber_terminal_cost_fn(SA_array^[i]^.lines/FillFactor,feeder_distance,SA_array^[i]^.density,
177                       n2016,n1344,n672,n96,n24,pct_ugd,pct_bur,pct_aer);
178           SA_array^[i]^.interface_cost := tmp3;
179           SA_array^[i]^.n2016 := n2016;
180           SA_array^[i]^.n1344 := n1344;
181           SA_array^[i]^.n672 := n672;
182           SA_array^[i]^.n96 := n96;
183           SA_array^[i]^.n24 := n24;
184        end
185        else if technology = t_1 then
186        begin
187           SA_array^[i]^.t1_terminal_cost := t1_terminal_cost_fn(SA_array^[i]^.lines/FillFactor,n96,n24);
188           SA_array^[i]^.interface_cost := tmp3;
189           SA_array^[i]^.nc96 := n96;
190           SA_array^[i]^.nc24 := n24;
191           n2016 := 0;
192           n672 := 0;
193        end
194        else                                    { technology is analog }
195           SA_array^[i]^.interface_cost := tmp3;
196
197        { Add in switched DS1 line terminals }
198  (*
199        if (technology=copper26) or (technology=copper24) then
200        begin
201           SA_array^[i]^.t1_terminal_cost := SA_array^[i]^.t1_terminal_cost +
202                          t1_terminal_cost_fn((SA_array^[i]^.SwitchedDS1+SA_array^[i]^.SpclAccess
203                                   n96,n24);
204
```

ATTACHMENT J

Attachment J.

Populating the per line expense inputs would result in double counting since expense from ARMIS inputs would also be included unless the formulae are modified.

A suggested formula change for Distribution Total Cost in cell GE3 of the Investment Input Tab in the Wire Center expense module for selecting the ARMIS inputs for expenses if per line expenses are 0 is as follows

Existing Formula =IF(B3="",0,(CT3+('Exp Assignment'!$C$89*(CT3/(SUM(CT:CT))))+('Exp Assignment'!$C$88*'Investment Input'!FD3)+((PerLine!$C$50+PerLine!$C$63)*'Investment Input'!B3)))

Proposed Formula = IF(B3="",0,(CT3+ IF((PerLine!$C$50+PerLine!$C$63)=0, ('Exp Assignment'!$C$89*(CT3/(SUM(CT:CT))))+('Exp Assignment'!$C$88*'Investment Input'!FD3), ((PerLine!$C$50+PerLine!$C$63)*'Investment Input'!B3))))

Where:
B3 = Total lines
CT3 = Distribution Direct Cost
'Exp Assignment'!$C$89 = Expense Assignment for Distribution as per Direct Cost
'Exp Assignment'!$C$88 = Expense Assignment for Distribution as per Line Cost
'Investment Input'!FD3 = % Total Lines
'Investment Input'!B3 = Total lines
PerLine!$C$50 = Annual Per-Loop Expense for Distribution – Copper Feeder
PerLine!$C$63 = Annual Per-Loop Expense for Distribution - Fiber Feeder

Similar changes would be needed in cells GF3 to GS3 in the Investment Input Tab in the Wire Center expense module. For enabling the selection between per line and ARMIS inputs in the Density Zone expense module similar changes would be needed in the Exp by Service Tab.